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Entry, Exit, and Economic Growth: U.S. Regional Evidence

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Entry, Exit and Economic Growth: US Regional Evidence

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Abstract

Entry rates have a negative long-run effect on US regional growth, which contradicts innovation-based growth models. This puzzle is resolved when a model-consistent specification is estimated using per capita entry growth. Evidence supports the Schumpeterian hypothesis of a positive relationship between exit and economic growth.

JEL classification: O30, O40, O51

Key words: Entry-exit rates; Per capita entry-exit growth; Economic growth

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1 Introduction

Recent research has documented a declining trend in the rates of entry and exit in the US economy (Decker et al. (2014), Hathaway and Litan (2014)). Similarly, job creation from business startups, and job destruction have also experienced a downward trend (Davis et al. (2006), Davis et al. (2010)). Taken together, these stylized facts are indicative of declining business dynamism and entrepreneurial activity. Although understanding the precise sources of these trends and their implications for productivity is an active research area (Haltiwanger (2011)), their consequences for US economic growth have not yet been determined. The purpose of this note is to fill this gap. The main question that we ask is: what are the long-run effects of business dynamics on US regional growth? We use the term 'business dynamics' as a catchall for the number of incumbents in the market, along with flows of entry and exit. Our empirical analysis is based on US regional data over the period 1977-2011.

Recently, Fernald and Jones (2014) have shown that innovation-based theories account for the largest contribution in the decomposition of aggregate US growth.[1] There are two leading endogenous growth models, namely, the Schumpeterian model (Aghion and Howitt (1992), Aghion and Howitt (1999)) and the product variety model (Romer (1990)). The Schumpeterian theory predicts that the long-run rate of growth should be positively related to the flow of entry and exit of firms. This connection is based on the creative destruction process: entering firms raise productivity due to new-and-better output varieties, and together with innovating incumbents, can drive out other firms that kept old-and-worse technologies. Hence, exit also plays a crucial role in fostering growth. As pointed out by Aghion and Howitt (2006), the positive relationship between economic growth and exit is a distinguishing testable implication of the Schumpeterian theory competing with the product variety model, where the flow of exit is negatively related to growth.

In the empirical analysis of this paper, the flows of entry and exit are introduced in two different ways: as rates relative to the number of incumbents and as per capita rates of growth relative to the previous observation. We show that this distinction is critical for interpreting the relationship

[1] They find that R&D spending explains 61% of US growth during the period between 1950 and 2007.

between business dynamics and US regional growth.

The rest of this note is organized in four sections. Section 2 describes our data sources and the variables involved in the empirical exercises. Section 3 presents the empirical framework. Section 4 reports and discusses the results. Section 5 concludes.

2 Data

We use regional data from the US economy on business dynamics and economic growth. The source for entry and exit data is the Business Dynamics Statistics (BDS) from the US Census Bureau, with annual data available for the period 1977-2011 covering the 50 states and the District of Columbia. Each observation is defined by state s and year t. We directly retrieve the following time series from the BDS: the total number of establishments, $N_t(s)$, establishment entry, $N_t^E(s)$, and establishment exit, $N_t^X(s)$. An establishment is defined in the BDS as 'a single physical location where business is conducted or where services or industrial operations are performed'.[2] Rates of entry and exit are provided by the BDS, and we denote these rates as $BDS_t^E(s)$ and $BDS_t^X(s)$, respectively.[3] In addition, we compute annual rates of growth of per capita levels, using population data from the Bureau of Economic Analysis (BEA) for obtaining per capita series. For example, $g_{n_t^E}(s) = 100\left(n_t^E(s)/n_{t-1}^E(s) - 1\right)$ is the growth rate (percentage) of per capita establishment entry in state s from year $t-1$ to year t, where $n_t^E(s)$ denotes per capita entry. The data for state-level real Gross Domestic Product (GDP) are taken from the United States Regional Economic Analysis Project from the BEA. Finally, we obtain the rates of long-run economic growth as the compound annualized rates of per capita real GDP and denote them in percentage terms as $g_y(s)$, for s=1,2,...,51.

[2] Establishment entry (exit) is defined as the number births (deaths) within the last 12 months. We have chosen not to look at firm data because in the BDS a firm with establishments in multiple states is counted multiple times, once in each state, irrespective of the portion of the firm residing in that state.

[3] The BDS normalizes the ratio of entry and exit rates by the average of the current and previous observations. Hence, the entry rate of state s in year t is $BDS_t^E(s) = 100\left(N_t^E(s)/(0.5(N_t(s) + N_{t-1}(s)))\right)$, whereas the corresponding exit rate is $BDS_t^X(s) = 100\left(N_t^X(s)/(0.5(N_t(s) + N_{t-1}(s)))\right)$.

3 Empirical framework

According to the innovation-based growth theories mentioned in the introduction, either business creation and destruction, or an increase in the number of varieties may have positive effects on total factor productivity, which in turn influences long-run growth. Previous research has used entry and exit rates (as defined above) in the empirical specifications (Aghion et al. (2005)). We initially follow this approach and examine how entry and exit rates affect per capita income growth. Particularly, we consider the following cross-sectional linear regression

$$g_y(s) = \phi_0 + \phi_n n(s) + \phi_E BDS^E(s) + \phi_X BDS^X(s) + \beta \log y_0(s) + u(s) \tag{1}$$

where $s = 1, ...51$, ϕ_0 is a constant scale parameter, and $u(s)$ is the error term. The dependent variable is the state-level rate of growth of per capita income, $g_y(s)$, with no time subscript reflecting the compound annualized rate over the period 1977-2011. In (1), we consider the average entry rate ($BDS^E(s)$) and the average exit rate ($BDS^X(s)$) defined in the BDS, along with the average per capita level of total number of establishments, $n(s)$. We derive the testable implications directly from the creative destruction and R&D-based expanding product varieties theories collected in Table 1. Although our focus is not on the implications of the neoclassical growth theory, we do account for potential convergence effects due to differences in marginal returns to capital across the US states. We use the standard approach in the empirical literature (Barro (1991), Barro and Sala-i-Martin (1992)) and add the initial (1977) level of the log of per capita income, $\log y_0(s)$, in the regressions. The convergence effect implies $\beta < 0$ in (1), that is, a state with average business dynamics and a low initial per capita level will tend to grow faster.

For each specification, we consider three cases. In Case I we drop the entry and exit rates to isolate the influence of the total number of establishments. Due to the high positive correlation of 0.96 found between average entry and exit rates across the US states in the BDS, we introduce these variables individually in the regressions, as Cases II (entry rate only) and III (exit rate only), respectively.

Table 1: Testable hypotheses

Innovation-based growth theories (Romer (1990)/Aghion and Howitt (1992))	$\phi_n > 0$
Creative destruction (Aghion and Howitt (1992))	$\phi_E > 0$ and $\phi_X > 0$
Expanding product varieties (Romer (1990))	$\phi_E > 0$ and $\phi_X < 0$
Convergence (Barro (1991)/Barro and Sala-i-Martin (1992))	$\beta < 0$

4 Results

Table 2 presents the results for specification (1). The average volume of establishments per capita has a positive ($\phi_n = 0.06$) and statistically significant (p-value $= 0.00$) effect on per capita income growth, consistent with the prediction of innovation-based growth theories. The exit rate has a negative ($\phi_X = -0.17$) and statistically significant (p-value $= 0.00$) effect on income growth, which supports the prediction of the expanding variety model but not the creative destruction model. We also find evidence for β-convergence across US states, as the coefficient on initial per capita income is negative and statistically significant (in all the three cases, though, especially in case I). Most strikingly, however, entry rates have a negative ($\phi_E = -0.10$) and statistically significant (p-value $= 0.00$) effect on US regional growth. The negative effect of entry rates on per capita income growth is a puzzling result because it is neither consistent with the Schumpeterian creative destruction process nor the variety model.

4.1 Resolution of the puzzle

Let us consider a Cobb-Douglas production technology

$$y_t = A_t k_t^{\alpha} \tag{2}$$

Table 2: Cross-sectional regressions with BDS rates, (1).

Variable	I	II	III
Constant (ϕ_0)	19.077^{***}[0.00]	14.513^{**}[0.01]	15.017^{**}[0.01]
	(6.912)	(6.581)	(6.389)
Establishments per capita (ϕ_n)	0.064^{***}[0.00]	-	-
	(0.018)		
BDS entry rate (ϕ_E)	-	-0.100^{***}[0.00]	-
		(0.030)	
BDS exit rate (ϕ_X)	-	-	-0.168^{***}[0.00]
			(0.051)
$\log(y_0)$ (β)	-1.103^{***}[0.00]	-0.671^{*}[0.08]	-0.667^{*}[0.08]
	(0.297)	(0.395)	(0.385)
$\bar{R}^2$	0.34	0.30	0.30

Notes: $N = 51$, *** and * denote statistical significance at the 1% and 10% levels, respectively, p-values in square brackets, heteroskedasticity-robust standard errors in parenthesis.

where y_t is output per worker, k_t is capital per worker, and A_t is total factor productivity (TFP). Following the innovation-based theories of growth, total establishments, entry, and exit may directly affect TFP. To validate such assumptions, we capture these effects in a reduced-form way that defines A_t as follows

$$A_t = A_0 n_t^{\bar{\phi}_n} (n_t^E)^{\bar{\phi}_E} (n_t^X)^{\bar{\phi}_X} \tag{3}$$

with $A_0 > 0$. We assume TFP to be increasing in per capita total establishments ($\bar{\phi}_n > 0$), increasing in per capita entry ($\bar{\phi}_E > 0$), and either increasing or decreasing in per capita exit ($\bar{\phi}_X \lesseqgtr 0$), analogously to the coefficient interpretation as surveyed in Table 1. Inserting (3) in (2), taking logs and the first difference, we get

$$g_{y_t} = \bar{\phi}_n g_{n_t} + \bar{\phi}_E g_{n_t^E} + \bar{\phi}_X g_{n_t^X} + \alpha g_{k_t} \tag{4}$$

Based on (4), the cross-sectional empirical specification in terms of long-run growth rates is

$$g_y(s) = \bar{\phi}_0 + \bar{\phi}_n g_n(s) + \bar{\phi}_E g_{n^E}(s) + \bar{\phi}_X g_{n^X}(s) + \bar{\beta} \log y_0(s) + \bar{u}(s) \tag{5}$$

where the initial level of per capita income is again used to capture the convergence effect.

Before estimating (5), we check the cross-sectional correlations. Table 3 and Figure 1 show negative correlations between the average BDS rates of either entry or exit, and the growth rates of per capita income.

Table 3: Cross-sectional correlations.

Average BDS rates	Average per capita entry-exit growth rates
$\mathrm{Corr}(BDS^E(s), g_y(s)) = -0.46^{***}$	$\mathrm{Corr}(g_{n^E}(s), g_y(s)) = 0.53^{***}$
$\mathrm{Corr}(BDS^X(s), g_y(s)) = -0.47^{***}$	$\mathrm{Corr}(g_{n^X}(s), g_y(s)) = 0.44^{***}$

Notes: *** denotes statistical significance at the 1% level.

By contrast, the correlations are significantly positive between the rates of growth of either per capita entry or exit, and the growth rates of per capita income. Finally, average per capita levels of entry and exit are statistically uncorrelated with regional economic growth.[4] These two latter findings can explain why entry and exit rates are negatively correlated with average income growth (Schumpeterian puzzle): a greater total number of establishments may result in lower entry-exit rates and higher economic growth. Hence, the negative correlations may spuriously occur due to an increase in the number of varieties (the stock) rather than a flow effect from entry and exit.

Table 4 provides the estimation results for (5). As we did with specification (1), there are three cases: I (per capita establishment growth), II (per capita entry growth), and III (per capita exit growth). The estimation gives two key results. First, per capita entry growth has a positive ($\bar{\phi}_E = 0.44$) and statistically significant (p-value $= 0.00$) effect on per capita income growth. Thus, when we estimate the specification consistent with theory, the US regional data reveal that a higher average growth of new establishments per capita is conducive for faster economic growth. This theory-consistent specification, therefore, resolves the puzzle described above. Second, the

[4]The correlations (not reported in Table 3) are -0.06 and 0.03, respectively. Both are statistically insignificant even at the 10%.

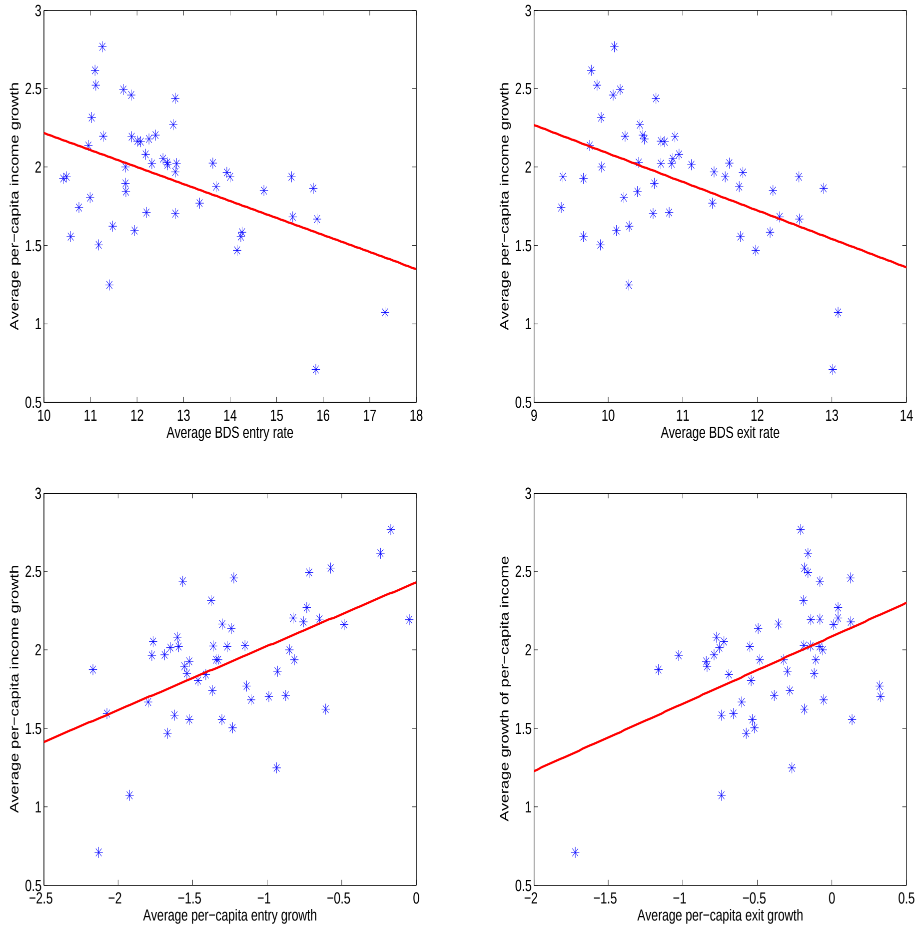

Figure 1: Cross-sectional correlations (linear fit).

average growth of per capita establishment exit also has a positive ($\bar{\phi}_X = 0.40$) and statistically significant (p-value $= 0.00$) effect on the long-run per capita income growth. This finding does not support the expanding variety view but, nevertheless, lends support to the Schumpeterian creative destruction hypothesis. We interpret the result as follows: growing numbers of innovating entrants and incumbents that enhance productivity also increase exit growth of less productive establishments, which raises overall productivity growth, and hence contributes to long-run economic growth. Thus, after estimating the growth rate specification (5) that is consistent with the underlying innovation-based theories, we find that business dynamism has a positive effect on growth by means of higher growth in both per capita entry and exit. Finally, the results provide evidence

Table 4: Cross-sectional regressions with per capita growth rates, (5).

Variable	I	II	III
Constant ($\bar{\phi}_0$)	17.774^{***}[0.01]	18.461^{***}[0.00]	13.569^{**}[0.02]
	(7.422)	(4.873)	(5.992)
Establishments growth ($\bar{\phi}_n$)	0.724^{***}[0.00]	-	-
	(0.167)		
Entry growth ($\bar{\phi}_E$)	-	0.439^{***}[0.00]	-
		(0.087)	
Exit growth ($\bar{\phi}_X$)	-	-	0.397^{***}[0.00]
			(0.115)
$\log(y_0)(\bar{\beta})$	-0.957^{**}[0.02]	-0.948^{***}[0.00]	-0.682^{**}[0.05]
	(0.441)	(0.291)	(0.357)
$\bar{R}^2$	0.37	0.43	0.27

Notes: $N = 51$, *** and ** denote statistical significance at the 1% and the 5% percent levels, respectively, p-values in square brackets, heteroskedasticity-robust standard errors in parenthesis.

for US regional convergence in the three cases as the estimate of $\bar{\beta}$ is negative and statistically significant.

5 Conclusion

This paper has looked into how business dynamics affects economic growth using US regional data over the 1977 to 2011 period. We have employed long-run average and cross-sectional analysis to test alternative hypotheses implied by innovation-based theories of economic growth. A striking finding is that entry rates as defined in the Business Dynamics Statistics database have a negative effect on US regional growth that is at odds with the prediction of the theories. We show that the appropriate cross-sectional specification should have the rates of growth of per capita entry and exit in the regression. If so, both entry and exit have a positive effect on US regional growth, consistent with the predictions of Schumpeterian growth theory.

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